Increasing the environmental potential of territories through the implementation of redevelopment projects

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Abstract. The main idea of the article is to highlight the positive impact of redevelopment on ecology. Redevelopment is a process of transforming existing buildings, infrastructure, and land in urban areas. It is a crucial element in urban planning that aims to optimize land use and create sustainable and livable cities. In recent years, there has been a growing interest in sustainable urban development, and redevelopment has emerged as a potential solution to the challenges of urbanization. The redevelopment of underutilized or obsolete buildings and sites can help to reduce the environmental impact of urban areas by promoting energy efficiency, reducing carbon emissions, and conserving natural resources. Moreover, the use of modern technologies and sustainable building materials in redevelopment projects can lead to the creation of more eco-friendly buildings that are better adapted to the needs of the environment and the community. The involvement of local residents and stakeholders in the planning and execution of redevelopment projects can ensure that the projects are aligned with the needs and expectations of the community. In conclusion, the article emphasizes the importance of considering ecological factors in urban development and highlights the potential benefits of redevelopment in creating more sustainable and livable cities. By embracing redevelopment as a tool for urban regeneration, we can improve the quality of life for city dwellers, preserve natural resources, and reduce the environmental impact of urban areas.

Key words: redevelopment, investment project, ecological development, efficiency, integrated and sustainable development of research, urban planning, urbanization

1 Introduction

The ecologization of urban areas, which is considered one of the main objectives of implementing the concept of sustainable development, has gained significant relevance and popularity in the field of urban development. However, real-world management decisions reveal a deficiency in the holistic perspective on balancing interests as a means of addressing urban environmental issues [1]. This is evident in some urban planning decisions implemented in recent years, which prioritize economic considerations over common sense and lack a strategic vision for environmental consequences. To ensure comprehensive and sustainable development of rural areas, the application of the redevelopment concept, which involves the reconstruction and renovation of existing objects and territories, can be considered. Redevelopment is a

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process that involves transforming abandoned territories and outdated objects into viable urban spaces with new purposes. This approach can be effective for both large megacities (with acute shortages of free territories) and small towns, where old industrial objects such as gas holders and factory workshops can become places of attraction, forming unique local identity [2].

Redevelopment is the process of rethinking and transforming their or non-functional experiences into modern, functional and comfortable urban spaces. This process is an important stage in the development of the urban community and economy, which makes it a relevant topic for study and analysis.

The concept of "redevelopment" first appeared in 1945 in the United States, when the "California Community Redevelopment Law" was passed in the state of California. Since then, the process of redevelopment has been implemented in almost all countries of the world, including Russia. Examples of successful projects include the Paradise Project in Liverpool, UK (fig1.); Templeborough in Rotherham, UK; the Eden Project in Cornwall, UK; Peark Silvertown in London, UK; The East hotel in Hamburg, Germany; the Olympic Park in Munich, Germany; the High Line park in New York, USA; Huaxiang Christian Centre, Fuzhou, China (fig.2); the Serp i Molot and ZIL factories in Moscow, Russia; the "New Holland" space in St. Petersburg, Russia; the "Galeria" shopping center in St. Petersburg, Russia; the "Petrovsky" residential complex, "Palacio", "Riverside" in St. Petersburg, Russia; creative and art spaces "Tkachi", "Etazhi", "Erarta", "Lumiere-Hall", "ContourFamily", "Artmusa" in St. Petersburg, Russia [3].

![Figure 1. The Paradise Project in Liverpool, UK](image-url)
The programs and redevelopment projects implemented today affect the physical parameters of the urban environment, including:

- Architectural;
- Landscape;
- Accessibility parameters for people with limited mobility.

In addition, they have an impact on the economy and social sphere of the city, as well as on the ecological potential of the urban area. Taking into account ecological factors has become a mandatory component in various fields of activity, such as urban planning, industry, agriculture, and transportation. In urban planning, for example, ecological aspects are taken into account when developing city master plans and designing residential and commercial buildings, with a focus on the need for green areas, environmentally friendly materials, and conservation of energy and water resources. This attention to environmental issues is due to the fact that the population of urban areas is constantly facing the consequences of environmental pollution. This includes not only poor air and water quality and smog but also abandoned industrial sites, where one can see not only the remains of industrial zones turned into dumps but also feel the toxic fumes emanating from such areas.

2 Materials and Methods

Redevelopment of inactive and morally outdated industrial territories is one of the promising directions for the development of modern large cities that have limited territorial resources suitable for new construction. Industrial site redevelopment allows for effective transformation of urban environments, development of infrastructure, and overall increase in the economic and social attractiveness of the area.

According to available statistical data, sales began in 54 new real estate projects, including residential complexes and apartments, in Moscow in the second half of 2022. Of these, 18 projects (33%) were implemented as a result of redevelopment, which is 22% more than in 2021 (11%). Thus, the number of real estate objects that were reconstructed in a year increased by 4.8 times, and their total share in the real estate market increased by 3 times.

Therefore, it is thanks to the high activity of developers engaged in the implementation of redevelopment projects that the number of new real estate projects on the Moscow market in the second half of 2022 increased by 46% compared to the same period in 2021. However, despite the positive trend, according to some experts, the overall model of spatial development of the
Moscow agglomeration is inefficient in terms of comprehensive development and economic efficiency. In general, abandoned industrial and mid-zone areas with low building density, poorly developed infrastructure, and road networks are still present in the city center. Conversely, financial investments in the development of peripheral zones and new construction on undeveloped territories (including suburban fields) make up a significant share of the total number of projects. At present, additional efforts are needed to address the shortcomings of the current model of spatial development of the Moscow agglomeration in order to create conditions for optimal use of resources and attracting investments in economically attractive areas of the city.

In general, the transformation of industrial areas into commercial and residential real estate projects attracts investors, but there are several accompanying problems:

1. The presence of certain gaps in the legislation. The results of the analysis of the law on the comprehensive development of territories No. 373-FZ [12] allow us to draw conclusions that the law contains a large number of contradictions, leading to the destruction of a number of legal institutions, and in fact, the procedures for transforming built-up territories are denied.

2. Problems with owners of real estate. At the first stage of implementing redevelopment projects, there are a number of problems related to the presence of a large number of owners of real estate. Combining them into one large project is a difficult task, as each of them pursues their own goals and interests, which often do not coincide with public interests.

3. Urban planning analysis. One of the common and most widespread problems that arise from the redevelopment of industrial areas is the poorly thought-out implementation and subsequent maintenance of urban planning analysis of the area. As is known, the result of redevelopment, that is, the future object, should fit in organically and correctly with the surrounding environment, ideally complementing existing development with new and efficient functions. The result of poor urban planning analysis of the area is the Renovation of the Ostashkovskoe Shosse industrial zone, which has an area of approximately 83 hectares, but only about 4.5 hectares will be reconstructed according to the project. Despite the fact that various operating industrial enterprises surround this object from different sides, the environmental situation here is quite satisfactory, all enterprises operate according to modern standards and clean smoke to the required parameters. According to accepted sanitary norms and rules, insolation in residential premises should correspond to the normative duration. For example, for Moscow, which is part of the central zone, insolation in housing should be at least 2 hours. Along with the above, there are concerns that nothing will remain of historically valuable buildings except facades.

4. Environmental problems arising in the process of implementing redevelopment projects of industrial areas. The difficulty of processing and disposing of a large amount of waste remaining from the demolition of industrial facilities is the cause of the formation of new landfills and the emergence of new potential environmental problems. In addition, the environmental condition of most industrial areas is not entirely favorable for human habitation.

3 Result and decision

One of the most actively developing cities in Russia, with a large number of successful redevelopment projects, is Kazan, the capital of the Republic of Tatarstan [4]. Kazan is one of the most beautiful cities in Russia, a major industrial, cultural, and educational center, and the "Third capital of Russia". In recent years, the city has been actively developing, particularly thanks to the implementation of a number of successful redevelopment projects [5].
One of the first such projects was the "Idea" Technopark (fig3). Redevelopment in Kazan began to actively develop in the early 21st century, when the first factories began to move their areas outside the city center. One of the first was the electrical engineering plant "Sviyaga", on the site of which the "Idea" Technopark is now actively developing. This is a class B+ business center that combines office space for anchor residents of the technopark (under a federal program) as well as for tenant companies [6-7]. The buildings are arranged in the shape of a rectangle, and the administrative and production buildings of the factory have been transformed into public and commercial spaces.

Another successful redevelopment project in Kazan is the development of the territory of the former "Kazan" airport. As part of this project, several modern residential complexes have been built, as well as social infrastructure facilities such as kindergartens, schools, and sports grounds. Thanks to this project, the territory of the former airport has been transformed into a new, modern district of the city with convenient transportation access and developed infrastructure [8].

The capital of Tatarstan has great potential for redevelopment, as evidenced by the large-scale project "Admiralteyskaya Sloboda", which covers an area of 365 hectares of industrial land. Development of the site began in 2012 and by 2030, a museum, park, residential and commercial areas will appear on the site of the former Admiralty. Thus, redevelopment projects in Kazan successfully demonstrate how the rethinking and transformation of inactive territories can become a key factor in the development of the city [9]. Thanks to successful strategies and a professional approach to project implementation, former industrial zones and transport infrastructure areas have been transformed into modern residential and commercial districts with developed infrastructure.

Innovations in legislation, the creation of innovative infrastructure facilities, as well as constant support from the authorities have allowed the Republic of Tatarstan to create a suitable environment for the continuous development of innovative activities of enterprises and organizations in the investment and construction complex. This phenomenon is confirmed by key indicators of business activity and is reflected in national ratings [10]. The foundation for successful strategic development of the Republic of Tatarstan is formed by constructive interaction with federal authorities, other regions of Russia, and potential foreign partners.

Kazan's experience can serve as an example for other cities facing challenges in restructuring their urban environment. Successful redevelopment can contribute to the creation of new jobs, attracting new investments and improving the quality of life for city residents. Figure 4 shows the integral indicators of the effectiveness of the implementation of redevelopment projects.
However, for successful redevelopment of territories, it is necessary not only to have a good understanding of the needs and expectations of residents and businesses, but also to take into account economic, social, and environmental aspects [12]. Moreover, it is important to ensure a harmonious combination of old and new buildings to preserve the historical value and cultural heritage of the city.

It should be remembered that the implementation of redevelopment projects is a lengthy and complex process that requires not only financial resources but also technical and organizational resources [13].

Besides the economic benefits, redevelopment can also have a positive impact on the environment and the ecological potential of the city's territory. Below are several ways in which redevelopment can reduce negative environmental impact and even contribute to its improvement:

1. Reducing road traffic: In the process of redevelopment, the transport scheme is often re-planned and changed, which can lead to a reduction in road traffic. This, in turn, will reduce the level of harmful emissions, reduce road congestion and increase road safety.
For example, as part of the redevelopment project in Copenhagen, pedestrian and bicycle zones were created, which led to a reduction in the number of cars on the roads and improved air quality [14].

2. Restoring green spaces and improving the urban environment: Redevelopment can be used to restore green areas and create new parks and gardens. This not only helps to improve the urban environment but also helps to reduce air and water pollution levels. For example, in Singapore, in the process of reconstructing Penang Square, new parks, promenades, and lakes were created, which led to an improvement in the ecological situation in the city.

3. Using energy-efficient technologies.

4. Reducing waste and increasing recycling: For example, in the framework of redevelopment, complexes for the collection and recycling of waste can be created, as well as buildings with systems for collecting and using rainwater. As a result, the amount of waste going to landfills and polluting the environment will be reduced.

5. Implementation of redevelopment projects can stimulate the creation of environmentally friendly jobs, such as technology parks or innovation centers [15]. Such places can attract companies working in the field of ecology and energy efficiency, which, in turn, will lead to the development of new environmentally friendly technologies and the creation of jobs related to environmental protection.

6. Reduction of operating costs for buildings and infrastructure: This can be achieved through the use of energy-efficient technologies, installation of modern ventilation and air conditioning systems, as well as by reducing the amount of transport using roads. As a result, energy consumption and transport costs will be reduced, which will lead to a reduction in emissions and a decrease in negative impact on the environment.

4 Conclusion:

Redevelopment contributes to improving the quality of life, developing new types of activities, and solving transportation and environmental problems. In areas that have received new life, investment-attractive projects for residential complexes, shopping centers, co-working spaces, socially important sports facilities, museums, exhibition and art spaces, recreational areas, and leisure centers emerge. This explains why the redevelopment of industrial territories is one of the key principles of "green" construction.

Moreover, industrial zones have great potential for developing urban infrastructure. To successfully implement redevelopment, it is necessary to study global and domestic experience in implementing such projects. Redevelopment of industrial territories has the potential to improve the environmental situation, create new jobs, and attract investment. In the process of implementing redevelopment projects, environmental aspects must be taken into account to guarantee the safety and health of people and improve the quality of life in the region, as well as to ensure public participation in decision-making. In general, the transformation of outdated and unprofitable buildings and infrastructure can lead to the creation of a more sustainable and environmentally friendly urban environment.

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